

RAEMesh Reader (900MHz) User's Guide



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RAEMesh Reader User's Guide

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WARNINGS

Read Before Operating

This manual must be carefully read by all individuals who have or will have the responsibility of using, maintaining, or servicing this product. The product will perform as designed only if it is used, maintained, and serviced in accordance with the manufacturer's instructions.

WARRANTY REGISTRATION

Register your warranty online by visiting:

<http://www.raesystems.com/Support/ProductRegistration>

This ensures that your RAEMesh Reader is registered and ensures that we can let you know of important updates.

Proper Product Disposal At End Of Life



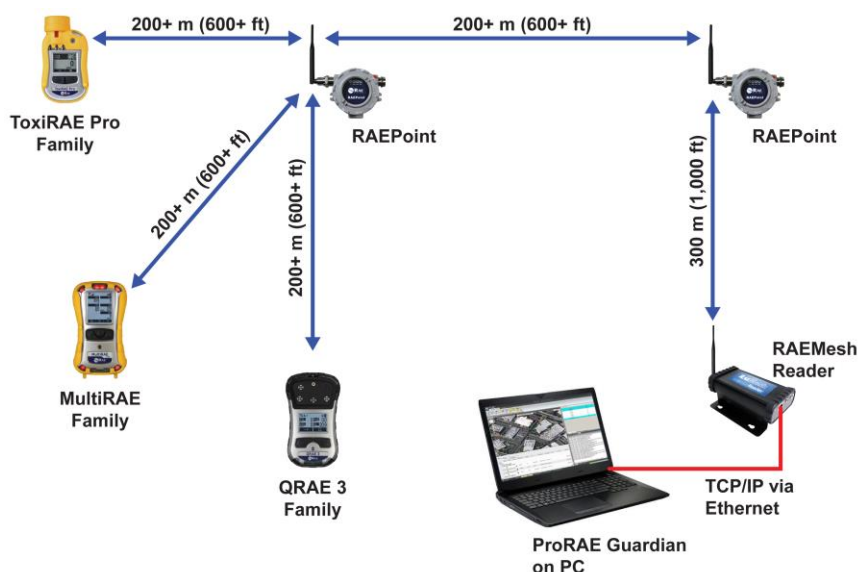
The Waste Electrical and Electronic Equipment (WEEE) directive (2002/96/EC) is intended to promote recycling of electrical and electronic equipment and their components at end of life. This symbol (crossed-out wheeled bin) indicates separate collection of waste electrical and electronic equipment in the EU countries. This product may contain one or more Nickel-metal hydride (NiMH), Lithium-ion, or Alkaline batteries. Batteries must be recycled or disposed of properly.

At the end of its life, this product must undergo separate collection and recycling from general or household waste. Please use the return and collection system available in your country for the disposal of this product.

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1 General Information

ProRAE Guardian software can communicate with remote monitors through RAEMesh Readers. Each RAEMesh Reader can wirelessly communicate with up to 50 remote monitors. The RAEMesh Reader can plug directly into a PC via a COM port, or one or more RAEMesh Readers can be networked through a TCP/IP connection via Ethernet to push sensor data to ProRAE Guardian. The networked setup allows communication with over 500 remote monitors and enables passive viewing of the system on other PCs running ProRAE Guardian.



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2 RAEMesh Reader Specifications

RAEMesh Reader

Communication	IEEE 802.15.4 Mesh Radio, ISM license-free bands, 900MHz
Operating Range	1,000' (300 m) line of sight
Maximum Monitors Supported	50
Certifications	FCC Part 15, CE
Digital Interface	RS-232; Ethernet RJ45 (802.3)
Power	DC 12V, 500mA
Size	6.5" x 3.5" x 1.7" (16.5 cm x 8.9 cm x 4.2 cm)
Weight	1.5 lb (0.6 kg)



RAEMesh Reader

Brazil Radio Specifications

Radio model: RM900A

Frequency range: Within 902 to 907.5 MHz and 915 to 928 MHz,
use IEEE 802.15.4 channel 1, 6, 7, 8, 9 and 10

Modulation: 802.15.4 DSSS BPSK

RF power(Tx): 20dBm

Data rate: 40kbps

IMPORTANT!

The RAEMesh Reader is for indoor use only. Protect it from sources of water and other liquids.

3 Requirements

3.1 Minimum Hardware Requirements

- Pentium (or compatible) CPU, 1GHz.
- VGA monitor (at least 1024x768 resolution, 16-bit color)
- 410MB of free hard disk space*
- CD-ROM drive
- 512MB RAM (1GB recommended)
- Serial port (RS232 COM port) for direct connection of MeshReader to PC
- Sound card (to enable voice notification)
- LAN for network connection of MeshReader(s) through TCP/IP

3.2 Minimum Software Requirements

Windows 2000 Pro (SP4) or newer, Adobe Acrobat Reader v6.0 or higher (to view online help)

3.3 Run-Time Requirements

The PC's "Energy Saving" feature should be set at "Always On." Never turn off the hard disk when ProRAE Guardian software is running.

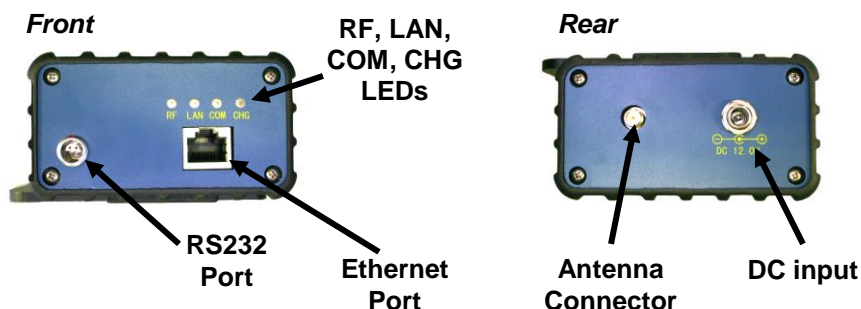
"Hibernate" (if available) must be disabled.

3.4 User Privilege Requirements

During installation and operation, you must have administrator privileges on the local PC.

4 Wiring RAEMesh Reader

The RAEMesh Reader can be mounted to any flat surface. It has three ports (DC power, RS232, and Ethernet). Use the supplied AC/DC power adapter for powering the RAEMesh Reader, and the RS232 port for diagnostic procedures. The Ethernet port accommodates a standard RJ45 plug connected to an Ethernet cable.



LEDs on the front of the RAEMesh Reader provide visual indication of the following (activity is indicated by blinking, except CHG, which glows steadily when power is on):

RF	Radio is active/communicating
LAN	LAN (via Ethernet port) activity
COM	Communications via the RS232 port
CHG	Power charging the RAEMesh Reader

5 Network Configuration

5.1 Configuring RAEMesh Reader Via Serial Port

RAEMesh Reader can connect to ProRAE Guardian via the RS232C cable (P/N 008-3003-000) included in the RAEMesh Reader package. Alternatively, it can be connected via an Ethernet cable. It can be configured by the ProRAE Guardian tool “Utility

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Program for RAEMesh Reader” via serial port communication.
Configuring the RAEMesh Reader allows you to:

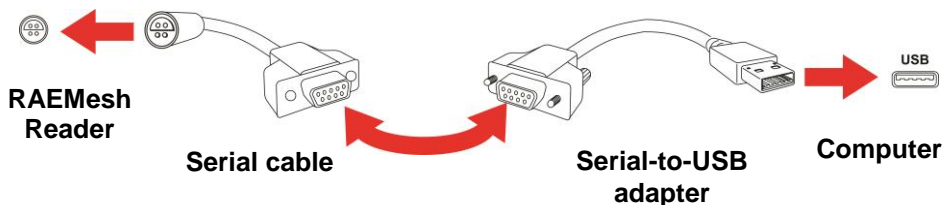
1. Set the IP address for the RAEMesh Reader
2. Set the PAN ID for wireless communications (000 through 999)

Notes:

1. You can configure the RAEMesh Reader via the RS232C cable, and then let it work with ProRAE Guardian via TCP network connection.
2. The utility uses UDP broadcasting and UDP port 2000 to communicate with the RAEMesh Reader. UDP broadcasting normally works in a LAN for a “Broadcasting Domain.” This means that the RAEMesh Reader must be a “neighbor” to the PC (such as within the same physical hub). Some firewall programs on your PC may forbid this kind of UDP communication, so this tool may not communicate with the RAEMesh Reader via network communication. Therefore, it is recommended that you configure the RAEMesh Reader via an RS232C cable.

5.2 Configuration With RS232

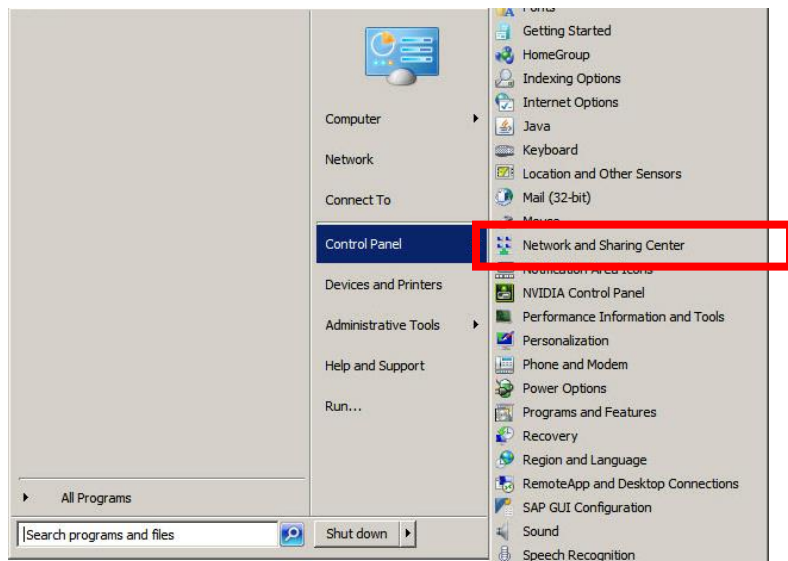
Plug the RS232C serial cable (P/N 008-3003-000) into the RAEMesh Reader and connect its 9-pin connector to the Serial-to-USB adapter (P/N 410-0210-000). Then plug the USB connector into the computer's USB port.



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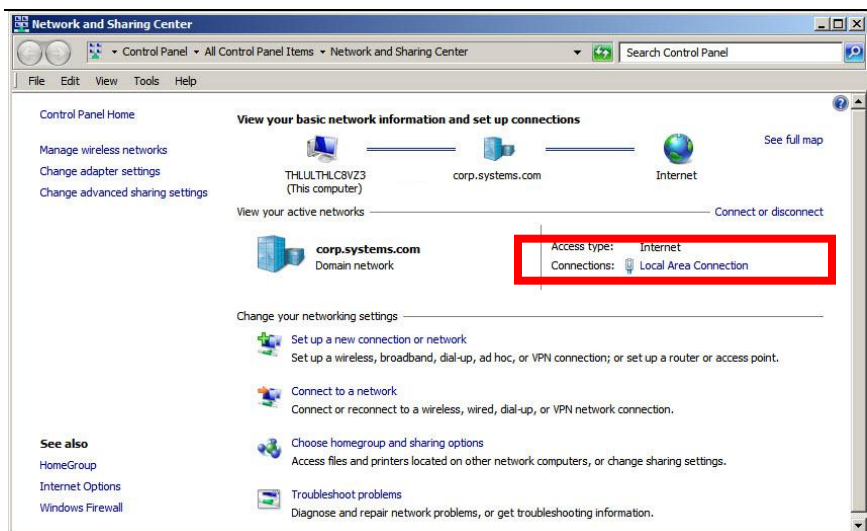
Click the “Start” button on your PC.

Click “Control Panel,” and when the menu appears, select “Network and Sharing Center.”



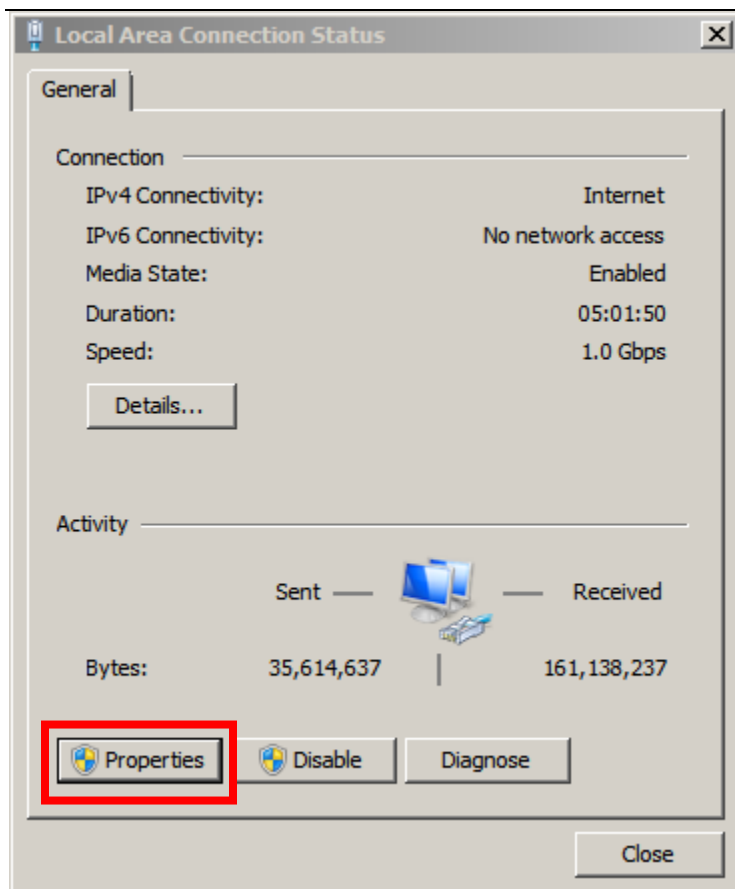
Click “Local Area Connection.”

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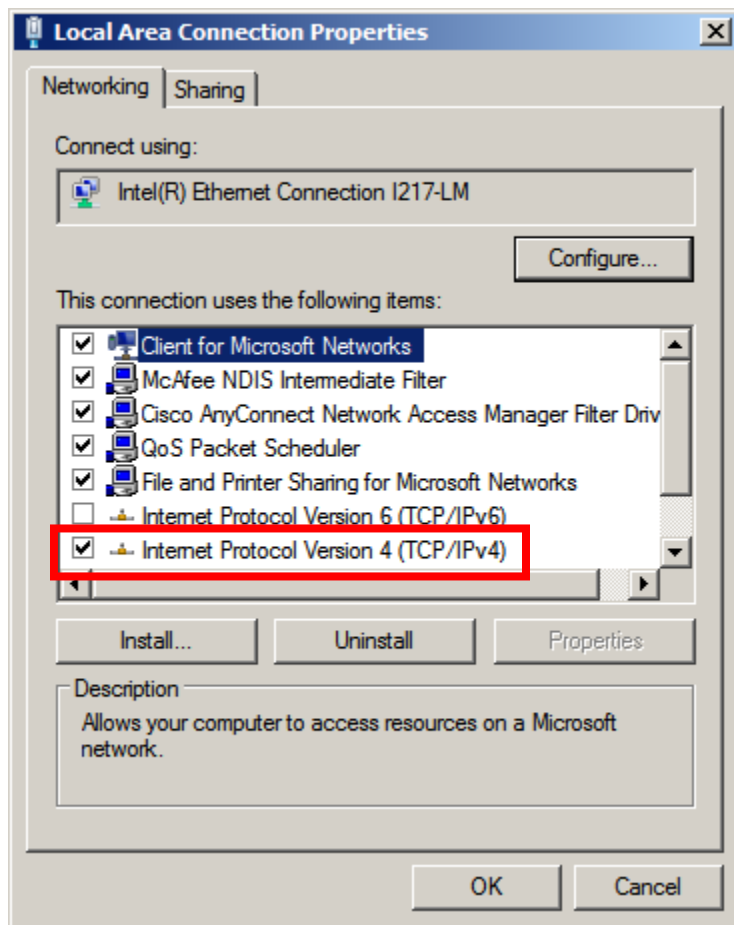
In the “Local Area Connection Status” window, click “Properties.”

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In the “Local Area Connection Properties” window, make sure that the “Networking” tab is selected, and check the box labeled “Internet Protocol Version 4 (TCP/IPv4)” is checked.



Now click “OK.”

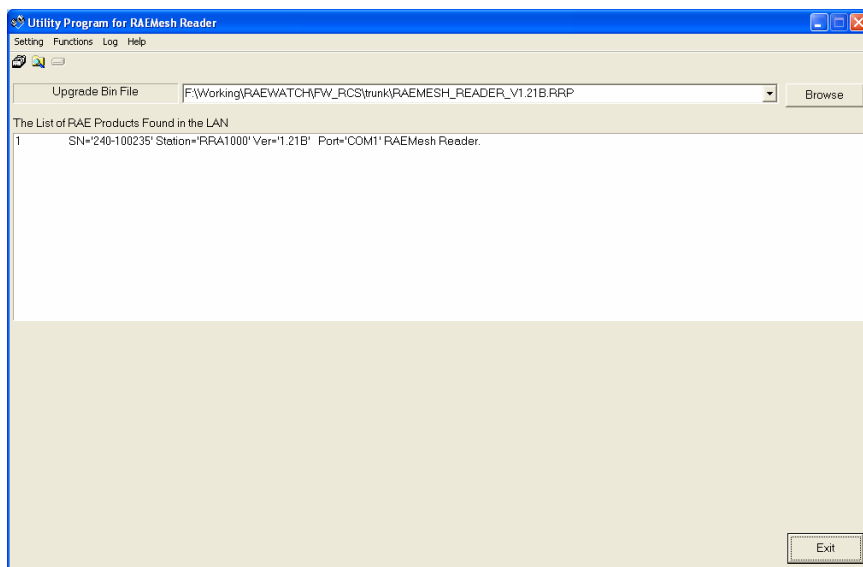
Click “Close” to close the “Local Area Connection Status” window, and then exit “Network and Sharing Center.”

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Start the utility by starting ProRAE Guardian, following this path:

Start >> Programs >> RAE Systems Inc. >> ProRAE Guardian >>
Tools >> Utility Program For RAEMesh Reader

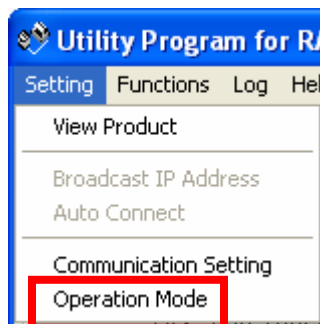
If the RAEMesh Reader is powered on and the RS232C cable connects the RAEMesh Reader to the PC, the RAEMesh Reader is included in the list, as shown here:



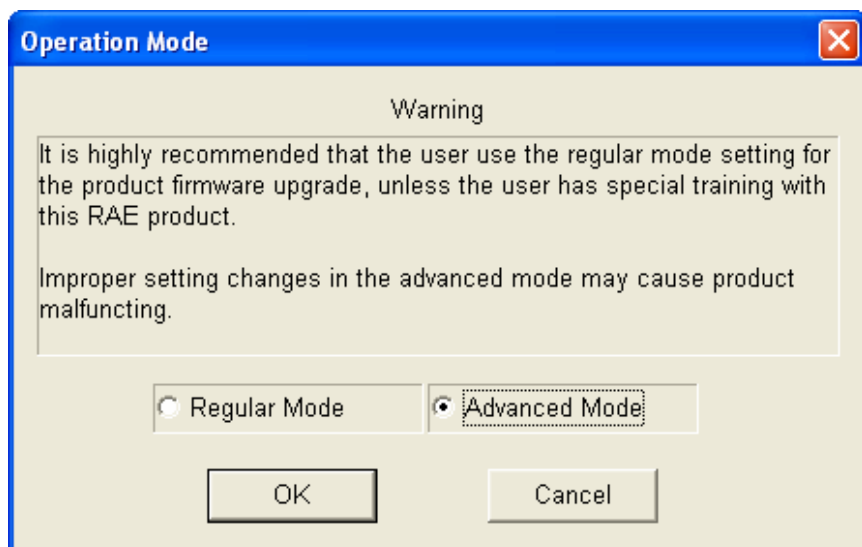
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5.2.1 Changing To Advanced Mode

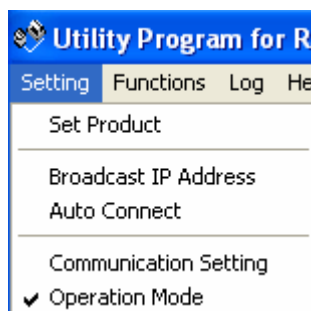
By default, this utility runs in “Regular Operation Mode.” You cannot change any of the RAEMesh Reader’s settings.



Click “Setting > Operation Mode” to switch to “Advanced Operation Mode.” In the Advanced Mode, you can make changes to the RAEMesh Reader. Click “OK” after making the proper selection.



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Note: The utility saves the Operation Mode selection and activates with the new selection the next time it is started.

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5.2.2 Configuring RAEMesh Reader

Double-click the RAEMesh Reader in the list. The settings window pops up:

Set Product

Product IP Setting

IP Address: 172 . 18 . 13 . 101
Netmask: 255 . 255 . 255 . 0
Gateway: 172 . 18 . 13 . 1
☒ Static IP ☐ DHCP

Remote PC Setting

IP Address: 172 . 18 . 13 . 100
Data Port: 9723 Recommend

Serial Port Setting

Baudrate: 38400

Product Information

Station: RRA1000
Product: RRA1000
Firmware Version: 1.40
Protocol: RCS
Serial Number: 240-000000
Upgrade Count: 121

Radio Information

CommID: 0021
PanID: 102 (0~999)
Channel: 06 (Hex, 01~0A)
Mode: ☐ Reader ☒ Reader (Remote) ☐ Router
Radio Type: RM900 (915MHz)
MAC Address: 00:90:C2:DD:FC:8E

Load Save Set Cancel

Configuring the RAEMesh Reader consists of setting the various parameters shown in this window.

5.2.3 Set The IP Address

If the RAEMesh Reader is set to communicate with ProRAE Guardian via a TCP/IP network, you must set the Reader's IP address and the PC's IP address properly.

If the RAEMesh Reader is set to communicate with ProRAE Guardian via an RS232C cable, ignore settings in the rest of this section.

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Note: Network communication is flexible. The RAEMesh Reader can be placed far away from the PC that runs ProRAE Guardian, using a LAN or WAN, provided that a TCP connection can be created.

5.2.4 Input The Server IP Address

Enter the PC's IP address that the ProRAE Guardian runs on and that the RAEMesh Reader will connect to. Otherwise, let the utility set it by clicking "Recommend" under the "IP Address" edit box.

Note: If the RAEMesh Reader cannot connect to the PC running the utility, do not use "Recommend" to get an IP address. Instead, manually enter the PC's IP address.

Manually confirming a PC's IP address:

1. Click the **Start** button.
2. Select **Run**.
3. Type **CMD**.
4. Press **Enter**.
5. Type **ipconfig**.
6. Press **Enter**.
7. Several lines of information are displayed. The IP address looks like "**149.72.61.234**".

Note: You can get the correct IP address by viewing the "About ProRAE Guardian..." and checking the "PRG IP Address"

If you are using wireless connectivity, look for "Wireless LAN adapter Wireless Network Connection" configuration.

If you are using ethernet connectivity, look for "Ethernet adapter Local Area Connection" (that is, look for the IPv4 Address).

You will also see the Subnet Mask and Default Gateway.

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5.2.5 Set The RAEMesh Reader's IP Address

If the LAN has a DHCP server, it is easy to set the RAEMesh Reader's IP address by choosing the default DHCP selection. The DHCP server in the LAN automatically sets the IP address properly after you connect the Reader to the network with an Ethernet cable.

If there is no DHCP server, you must set a static IP address. Click the "Static IP" option in the "Product IP Address" pane, enter the IP address, Netmask, and Gateway for the RAEMesh Reader.

Alternatively, you can click the "Recommend" button (next to the "Static IP" option) to let the tool select an IP address setting.

Note: The utility selects the IP address just next to the current PC's IP address, the Netmask is set to "255.255.255.0," and the Gateway is set to the PC's IP address. This will work for most cases, but it may cause IP address conflicts if any other PC uses this IP address.

The screenshot shows the 'Set Product' utility window with the following sections and fields:

- Product IP Setting:** IP Address (172.18.13.101), Netmask (255.255.255.0), Gateway (172.18.13.1). Radio buttons for Static IP (selected) and DHCP.
- Remote PC Setting:** IP Address (172.18.13.100), Data Port (9723), and a 'Recommend' button.
- Serial Port Setting:** Baudrate (38400).
- Product Information:** Station (RRA1000), Product (RRA1000), Firmware Version (1.40), Protocol (RCS dropdown), Serial Number (240-000000), and Upgrade Count (121).
- Radio Information:** CommID (0021), PanID (102 (0~999)), Channel (06 (Hex, 01~0A)), Mode (Reader (Remote) selected), and Radio Type (RM900 (915MHz)).
- MAC Address:** 00:90:C2:DD:FC:8E.
- Buttons:** Load, Save, Set, and Cancel.

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5.2.6 Set The RAEMesh Reader's Channel

Set the channel to match your network's channel. This varies according to the frequency of your RAEMesh Reader.

Set Product

Product IP Setting

IP Address: 172 . 18 . 13 . 101
Netmask: 255 . 255 . 255 . 0
Gateway: 172 . 18 . 13 . 1
☒ Static IP ☐ DHCP

Remote PC Setting

IP Address: 172 . 18 . 13 . 100
Data Port: 9723

Serial Port Setting

Baudrate: 38400

Product Information

Station: RRA1000
Product: RRA1000
Firmware Version: 1.40
Serial Number: 240-000000
Upgrade Count: 121
Protocol: RCS

Radio Information

CommID: 0021
PanID: 102 (0~999)
Channel: 06 (Hex, 01~0A)
Mode: ☐ Reader ☒ Reader (Remote) ☐ Router
Radio Type: RM900 (915MHz)

MAC Address: 00:90:C2:DD:FC:8E

These are the channels that can be used:

868MHz: Channel 0 only

900MHz: Channels 1 through 10

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The channel number must be input using hexadecimal values (hex):

Channel	Hex Value
0	00
1	01
2	02
3	03
4	04
5	05
6	06
7	07
8	08
9	09
10	0A

Click “Set” to finish the configuration.

Click “Save” to save the RAEMesh Reader's settings to a .rcf file.

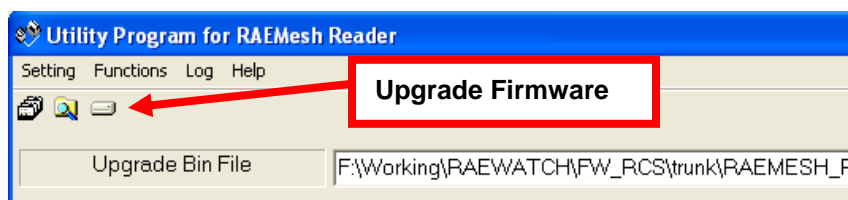
Click “Load” to load the reader settings from a .rcf file.

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5.2.7 Upgrading The RAEMesh Reader Firmware Via Ethernet

This procedure is almost the same as the one outlined in “Configuring The RAEMesh Reader Via Serial Port,” except it allows downloading firmware to the RAEMesh Reader.

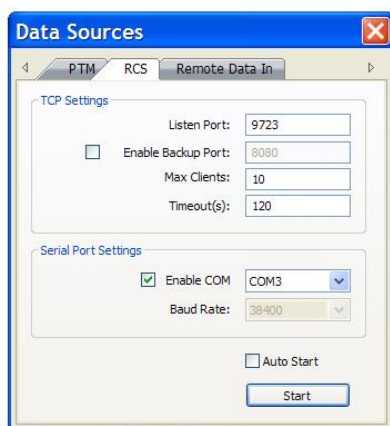
1. Click “RAEMesh Reader in the list.
2. Click “Browse” to select the correct firmware package.
3. Click the “Upgrade Firmware” icon to start the upgrade process.
4. Follow the instructions to upgrade firmware to the RAEMesh Reader.



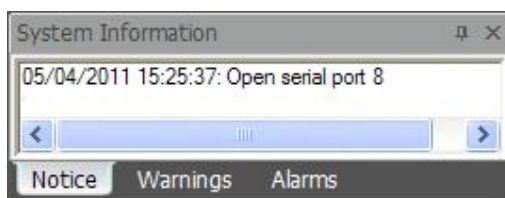
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5.2.8 Checking After Configuration

If the RAEMesh Reader connects to ProRAE Guardian via the computer's serial port, exit the utility program and configure ProRAE Guardian to "listen" on the COM port by clicking the "Enable COM" checkbox and then selecting the COM port via the pull-down menu. Then click "Start." You are now enabling the Data Sources dialog in ProRAE Guardian.



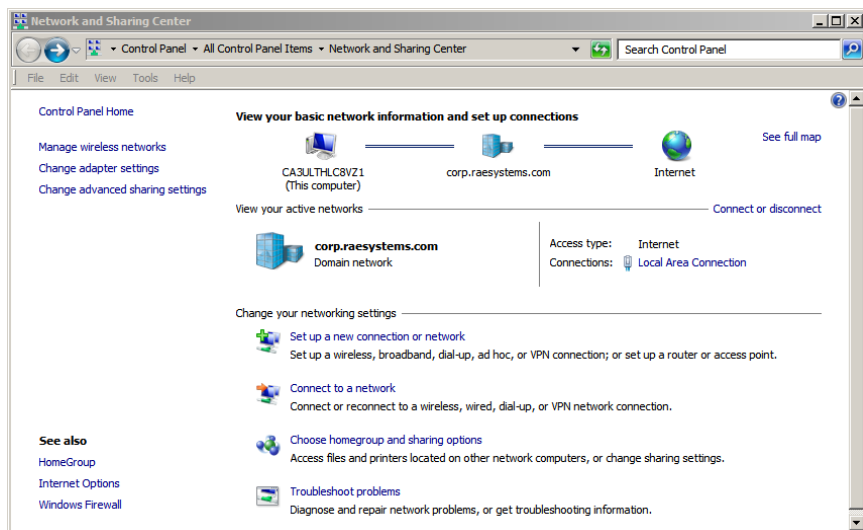
Verify the COM Port connection in the system information pane of ProRAE Guardian. This confirms that you are properly connected via the selected COM port.



6 Using Modbus Over TCP/IP

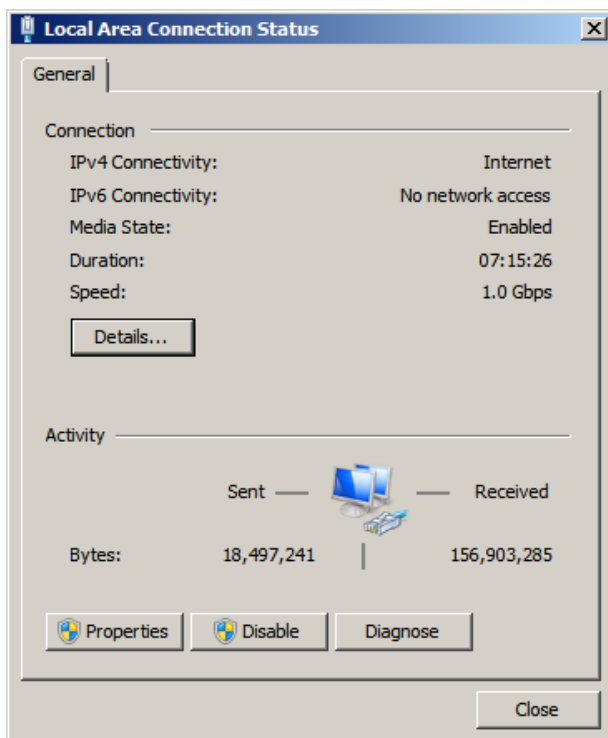
To use the Modbus protocol, follow these instructions.

1. You need the following equipment:
 - a. Computer
 - b. RAEMesh Reader
 - c. Ethernet switch
2. Connect the computer to the RAEMesh Reader via the Ethernet switch.
3. Designate an IP address to the computer (example: 192.168.1.100) and to the RAEMesh Reader (example: 192.168.1.186).
4. Set up the computer network connection.
 - a. For a Windows 7 PC:
 - i. Select Start >> Control Panel >> Network and Sharing Center.Then click “Local AreaConnection.



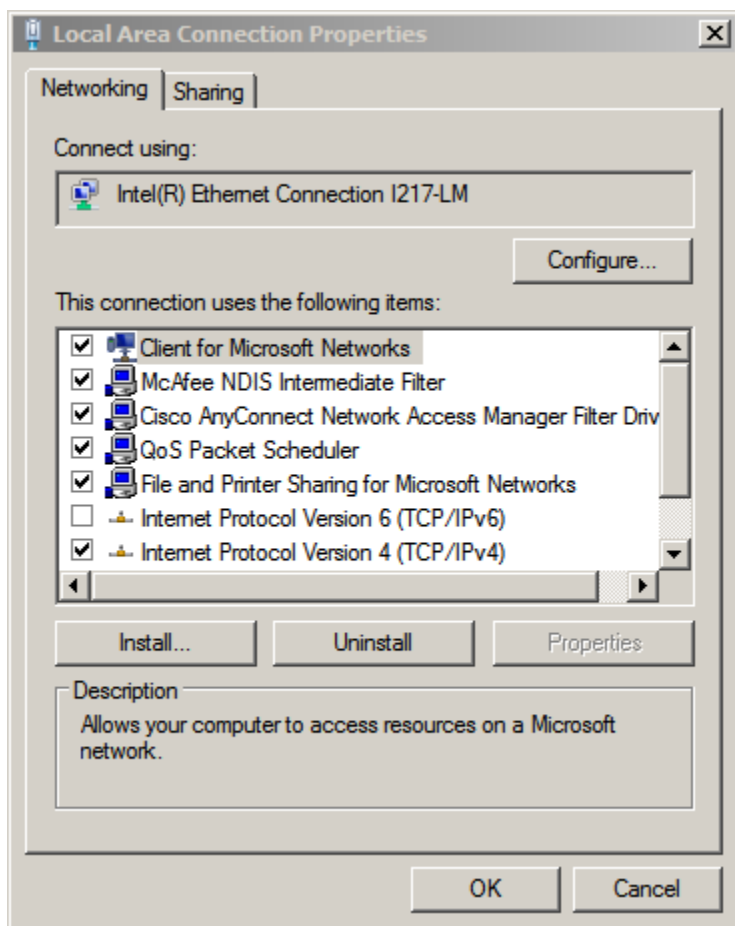
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- ii. In “Local Area Connection Status,” click the “Properties” button.



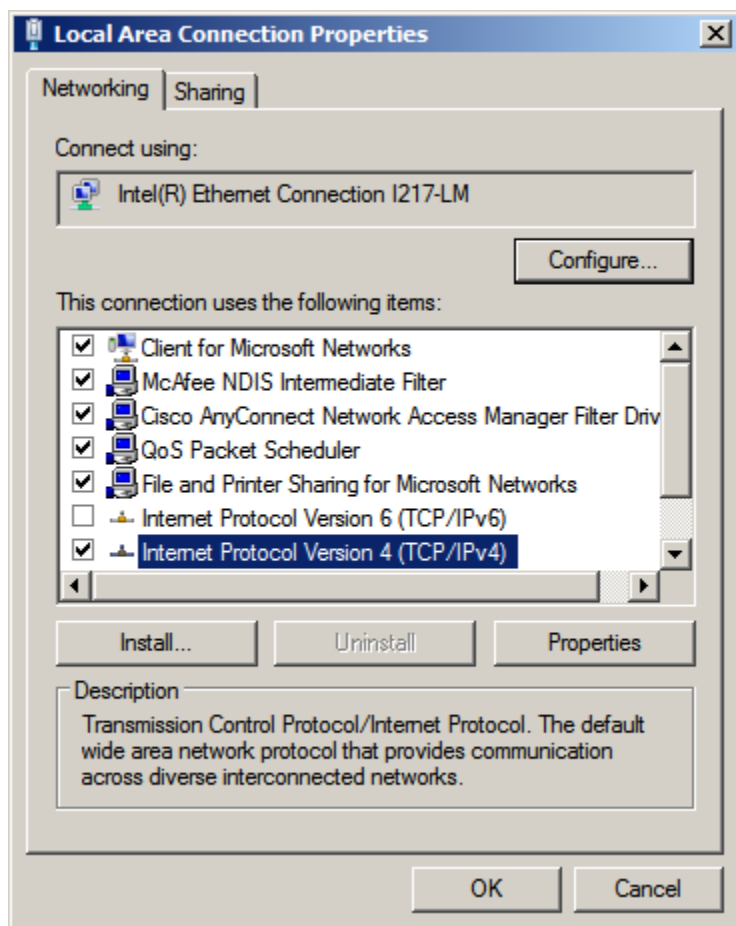
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- iii. In “Local Area Connection Properties,” check the “Internet Protocol Version 4.” Then click “OK.”



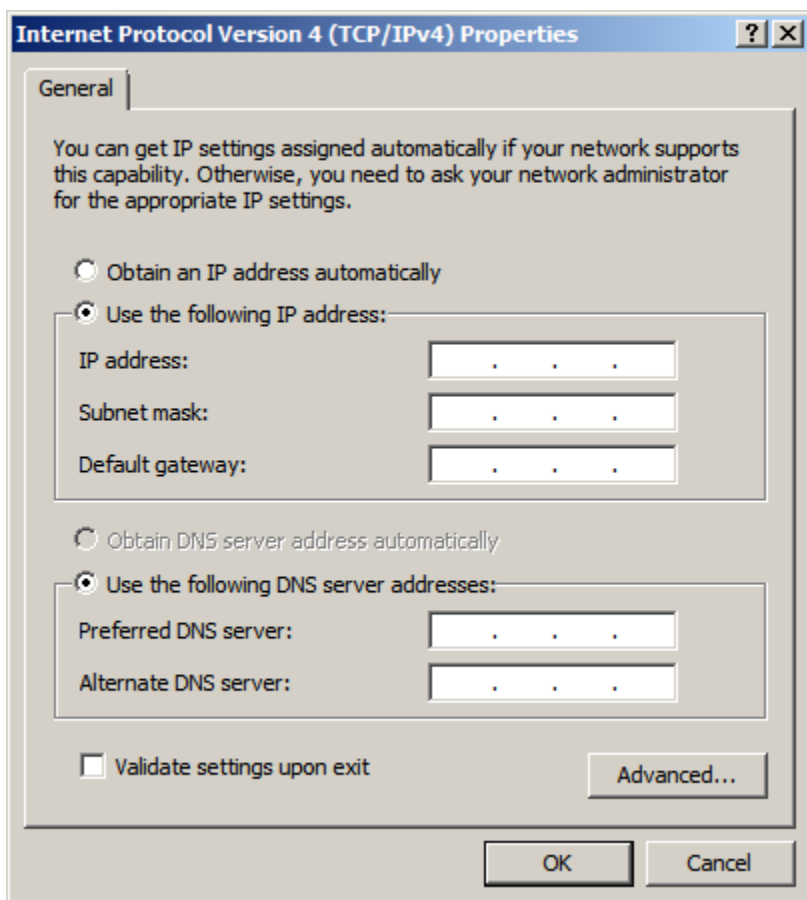
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- iv. Highlight “Internet Protocol Version 4 (TCP/IPv4)” and click “Properties.”



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5. Click the button that says “Use the following IP address”.



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- Set the following (this is an example; you may need to use other settings):

IP address: 192.168.1.100

Subnet mask: 255.255.255.0

Default Gateway: 192.168.1.1

The screenshot shows the 'Internet Protocol Version 4 (TCP/IPv4) Properties' dialog box with the 'General' tab selected. The dialog box contains instructions on how to obtain IP settings. Two radio buttons are present: 'Obtain an IP address automatically' (unselected) and 'Use the following IP address:' (selected). Below the selected radio button are three text input fields: 'IP address:' with the value '192 . 168 . 1 . 100', 'Subnet mask:' with the value '255 . 255 . 255 . 0', and 'Default gateway:' with the value '192 . 168 . 1 . 1'. Below these fields are two more radio buttons: 'Obtain DNS server address automatically' (unselected) and 'Use the following DNS server addresses:' (selected). Below the selected radio button are two text input fields: 'Preferred DNS server:' and 'Alternate DNS server:', both containing three dots. At the bottom left, there is a checkbox labeled 'Validate settings upon exit' which is unchecked. At the bottom right, there is an 'Advanced...' button. At the very bottom of the dialog box are 'OK' and 'Cancel' buttons.

- Click "OK."
- Exit Network and Sharing Center.
- Set up the RAEMesh Reader network connection.

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Start the Utility Program for RAEMesh Reader, and set the following:

i. Product IP Setting

IP Address: 192.168.1.186

Netmask: 255.255.255.0

Gateway: 192.168.1.1

ii. Remote PC Setting

IP Address: 192.168.1.100

Protocol: MODBUS

Click “Set.”

The screenshot shows the 'Set Product' utility window with the following settings:

- Product IP Setting:**
 - IP Address: 192 . 168 . 1 . 186
 - Netmask: 255 . 255 . 255 . 0
 - Gateway: 192 . 168 . 1 . 1
 - Buttons: Recommend, Static IP (selected), DHCP
- Remote PC Setting:**
 - IP Address: 192 . 168 . 1 . 100
 - Data Port: 9724
 - Button: Recommend
- Serial Port Setting:**
 - Baudrate: 19200 (dropdown)
 - Slave ID: 1
- Product Information:**
 - Station: RRA1000
 - Product: RRA1000
 - Firmware Version: 1.40
 - Protocol: MODBUS (dropdown)
 - Serial Number: 240-100525
 - Upgrade Count: 0
 - Button: Device List
- Radio Information:**
 - CommID: 38DD
 - PanID: 997 (0~999)
 - Channel: 0F (Hex, 0B~1A)
 - Mode: Reader (selected), Reader (Remote), Router
 - Radio Type: RM2400
 - MAC Address: 00:90:C2:ED:E2:B6

Buttons at the bottom: Load, Save, Set, Cancel.

Use the RAE Systems test program “FMC2000Demo.exe” to verify that it works.

7 Technical Support

To contact RAE Systems Technical Support:

Monday through Friday, 7:00AM to 5:00PM Pacific (US) Time

Phone (toll-free): +1 888-723-4800

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8 RAE Systems Contacts

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Be sure. Be safe

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